

# Ciders as a source of bioactive compounds

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## INTRODUCTION

Poland is one of the main producers of apples in Europe. The major part is consumed fresh, while a smaller is processed into juices, concentrates, purees or wines. Recently also the production of cider started in Poland. This fermented drink is produced in countries with a long tradition of drinking cider from the so-called cider varieties of apples. In our country, these varieties are rare. Therefore, the aim of this work is to check the suitability of selected domestic varieties of apples for cider production and evaluate the content of polyphenol compounds.

## EXPERIMENTAL METHODS

12 varieties of apples were used in our experiment: Alwa, Antonówka, Cortland, Gala, Gloster, Golden Delicious, Idared, Jonagold, Ligol, Mutsu, Szampion, Reneta. Apple musts were obtained by treatment of clean and crushed fruits with pectinolytic preparation Rohapect, and pressing the fruit pulp. Alcoholic fermentation was conducted for one week. After the process the amounts of by-products (1), total phenolics (2) and individual polyphenols were checked. Also sensory analysis has been carried out.

## RESULTS AND DISCUSSION

From the quantitative point of view, there are five major groups of polyphenols found in apples and apples products: flavan-3-ols, procyanidins, flavonols, dihydrochalcones, and hydroxycinnamic acids and derivatives (3). The content of polyphenol compounds in obtained ciders varied widely and depended on the apple variety used for fermentation. In most cases, the main group were hydroxycinnamic acid derivatives amounted from 5.26 (Ligol) to 99.30 mg/L (Jonagold). Only in three varieties (Cortland, Ligol and Szampion) predominated catechin derivatives. The main polyphenolic compound, in most cases, was chlorogenic acid (2.94-Ligol - 56.26 mg/L-Jonagold). The second of this group of compounds, p-coumaroylquinic acid was present in amounts of 0.17 (Szampion) – 23.67 mg/L (Antonowka). Catechin and its derivatives occurred in the quantities from 7.36-Reneta to 67.74 mg/L-Szampion. Another group of polyphenols were dihydrochalcones (1.19- Golden Delicious to 30.47 mg/L Reneta). Quercetin derivatives were present in the lowest amount at the level from 0.04 to 0.39 mg/L. The poorest in determined polyphenolic compounds have proven to be ciders obtained from a variety Ligol (32.22 mg/L) and richest with a variety of Alwa (154.15 mg/L). Cider manufactured with a variety of Alwa turned out to be the best in the organoleptic evaluation.

## CONCLUSIONS

The chemical composition and sensory properties of ciders depend mainly on the variety of apples used in their production.

## REFERENCES

1. Nowak A. et al., *Biotechnol. Food Sci.* 77 (1):11-23, 2013.
2. Gao X. et al., *J. Agric. Food Chem.* 48:1485-1490, 2000.
3. Piyasena P. et al., *LWT – Food Sci. Technol.* 35:367–372, 2002.